

GIS Data Layer Development

Final Report

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Introduction

The projects discussed in this report are a result of coordination between the Missouri Department of Transportation (MoDOT) and the Missouri Resource Assessment Partnership (MoRAP) staff. This report summarizes activities completed between July 1, 2004, and June 30, 2005. There are three different projects represented based on specific agency needs. These three projects were (1) continued progress on the archaeological database for the state of Missouri and a data delivery for the next iteration of the data, (2) updates of the metropolitan public lands data layer that was created in a previous project, and (3) acquisition of SEMA buyout lands data for a list of pre-determined counties.

The Missouri Department of Transportation (MoDOT), State Historical Preservation Office, Department of Natural Resources (SHPO-DNR), and Missouri Resource Assessment Partnership (MoRAP), are working together to create a geodatabase that will represent known areas of cultural significance in the state of Missouri. This is currently the second year for the project. The hard copy data captured includes survey and site polygons and selected accompanying attribute data. Surveys are areas that have been surveyed for archaeological sites, usually in areas where human infrastructure is slated to occur. Sites are identified locations of historical or cultural significance. Survey and site data were captured in a geodatabase using SDE and a SQL relational database server. This enables the digitizing of polygons and the attribution of tables to occur nearly simultaneously, and within one user interface. The project is built within ArcMap, and is portable and can be accessed by multiple users at once. The end goal is to have digital layers of archaeological surveys and sites statewide, including the attributes of the hard copy survey reports and site forms.

Goals

MoDOT has been a member of MoRAP from its inception in 1995, and has been a key state agency supporter. The overarching goals behind MoDOT's participation include the production of needed GIS and remote sensing information at low cost and the facilitation of coordination and cooperation among key MoDOT partners. Data layers produced cooperatively have wide buy-in from multiple agencies, which provided increased credibility, and funds are leveraged so that costs are shared among partners, therefore saving MoDOT money.

The proposed activities listed here are based on an ongoing project between MoDOT and MoRAP staff originally beginning in 2002. The initial data delivery occurred in June of 2004.

The goals of this project are to:

- 1) Continue populating the Archaeological database based on the Cultural Resources data housed at the State Historic Preservation Office (SHPO). This will include digitization of survey and site polygons, attribution of survey attribute tables, and attribution of site polygons in several pilot counties in the state.

- 2) Organize metropolitan public lands data supplied by MoDOT for several Missouri cities into a geodatabase. Clarify some table attributes found in some of the metropolitan public lands data supplied last year by several different agencies.
- 3) Determine the existence and availability of SEMA Buyout Lands data for a specified list of counties. Once availability is determined, acquire any existing data.

A summary of activities on these three initiatives follows in three separate sections.

Archaeology Database

MoDOT Contact: Bob Reeder
MoRAP Contact: Melissa Lanclos

Project Summary

For a number of years MoDOT, DNR, and the University of Missouri–Columbia have been discussing the usability and necessity of a digital representation of archaeological surveys and sites as an aid to cultural resource management and planning. After some months spent designing a methodology for data capture that is a best fit for end-users and a quick, streamlined, production oriented procedure, survey polygons and attributes for numerous counties have now been completely entered and checked for QAQC in a relational geodatabase. Our original goals were to form an interagency committee to guide database development and to design the database. The end goal of this project is to have a manageable and up-to-date digital representation of all archaeological surveys and site locations that have been and are being registered at SHPO. Counties are being completed based on two different factors. The first is the importance of the counties. These are counties that are most frequently being used by the consultants, have the most infrastructure development occurring, and usually have the largest metropolitan areas. Second, are the counties that have the least amount of surveys being conducted or are used the least frequently by consultants. SHPO has allowed these datasets to leave their building for short time periods, which has allowed data capture on-site at the MoRAP offices. The survey data for the following fifty-four counties have been captured and checked at the completion of this year's work, (due date June 30, 2005), for QAQC (Figure 1):

Atchison	Hickory	Reynolds
Barton	Howard	Ripley
Bates	Iron	Schuyler
Benton	Jackson	Scotland
Bollinger	Knox	Shannon
Boone	Lewis	St. Charles
Carroll	Lincoln	St. Clair
Carter	Linn	St. Louis
Cass	Maries	Ste. Genevieve
Christian	Mercer	Stone
Clay	Montgomery	Sullivan
Clinton	Morgan	Warren
Crawford	Oregon	Worth
Dade	Osage	Wright
Dallas	Ozark	
Daviess	Perry	
DeKalb	Pike	
Douglas	Polk	
Gasconade	Putnam	
Greene	Ralls	

The initial focus of the project team was to move forward to capture survey and site polygon information and to attribute survey polygons. During the early portion of this project the team had not yet settled on what site attributes to capture, so only site polygons and site IDs were being captured. However, the original project was modified in April 2005 to include the table attribution of sites within a pilot area. Based on committee meetings, the attributes were selected, and then MoRAP designed a database to facilitate data capture. All available sites were digitized and attributed in the following counties:

Christian	Pike
Lewis	Ralls
Lincoln	St. Charles
Linn	Ste. Genevieve
Perry	

The total number of sites and surveys digitized is as follows:

Surveys Captured This Period:	7,300 polygons
Total Surveys Captured for the Project:	9,500 polygons
Site Polygons Digitized but not Attributed this Period:	6,000 polygons
Sites Digitized and Attributed This Period:	2,100 polygons
Total Sites Captured for the Project:	11,000 (2,100 of which are fully attributed)

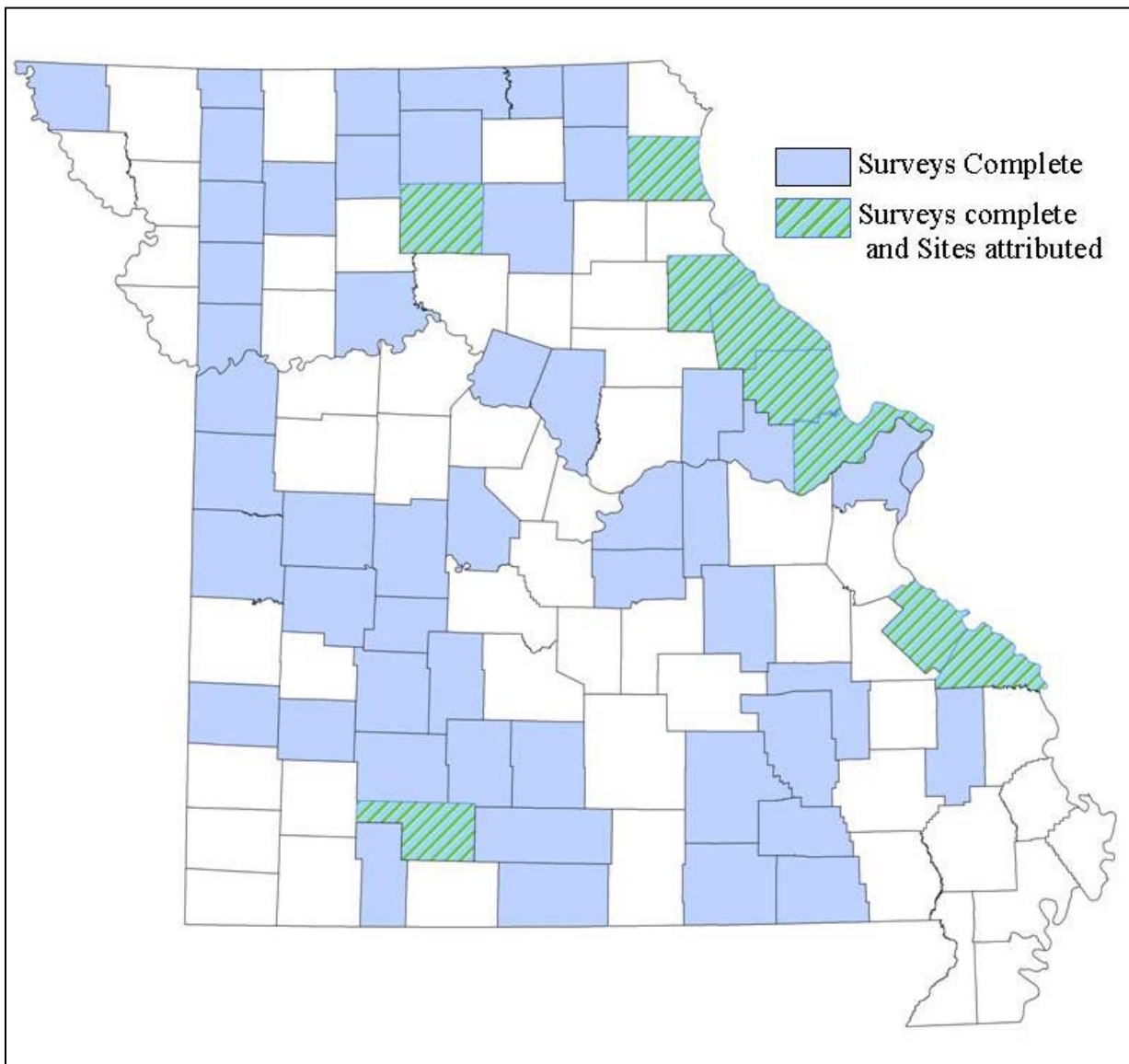


Figure 1. Counties with sites and surveys completed to date.

Since the data-dense counties have been completed, more than half of the survey data have been captured, which exceeds our timeline expectations. Fifty-four counties have been completely entered into the geodatabase and checked for QAQC and five more are in progress at the time of this writing. The number of surveys captured, 7,300, exceeded our goal of 6,100. The number of sites both digitized and attributed, 2,100, exceeded our expectation (modified from the original expectations via the securing of additional federal funds) of 2000. The geodatabase will be a useful tool for storing data, accessing data, providing information for researchers, and quickly updating data sets in the future.

The Army Corps of Engineers joined with us to help fund the completion of this data capture effort, which represents one other significant accomplishment related to this project.

General Methods and Procedures

This is an unusual project for MoRAP in that some data capture has been carried out by a MoRAP employee at the SHPO building in Jefferson City. One employee has been traveling to SHPO an average of two days a week since February, 2004. In addition, student workers have been working on selected rural counties at the MoRAP offices since May of 2004. We have also purchased new high-end laptop computers to ensure hardware availability for workers who travel to SHPO to collect data.

The data capture process is time consuming due to the complexity and variability in survey reports. Each report must have a topographic map with survey and site polygons superimposed to be included in the database, then the narrative, or text, section of the reports must be perused for the information required to attribute each survey polygon.

Before data capture can begin, the database must be “checked out” to the MoRAP laptop while connected to the SDE server at the USGS facility in Columbia. Upon arrival in Jefferson City, a box of survey reports is selected and data collection commences. The first step is to digitize a survey polygon in the correct spatial location using an ArcMap project specially built to help us locate the surveys and sites. Layers include but are not limited to digital raster graphics, roads, municipalities, stream networks, railroads, and county and quadrangle boundaries (Figure 2). After the polygon is digitized, the related tables (survey statistics, secondary author, methodology, project type, and related sites), can be checked for accuracy and filled in by culling through the narrative included in the survey report (Figure 3). These attributes are then linked to the survey polygon and related site polygons are digitized.

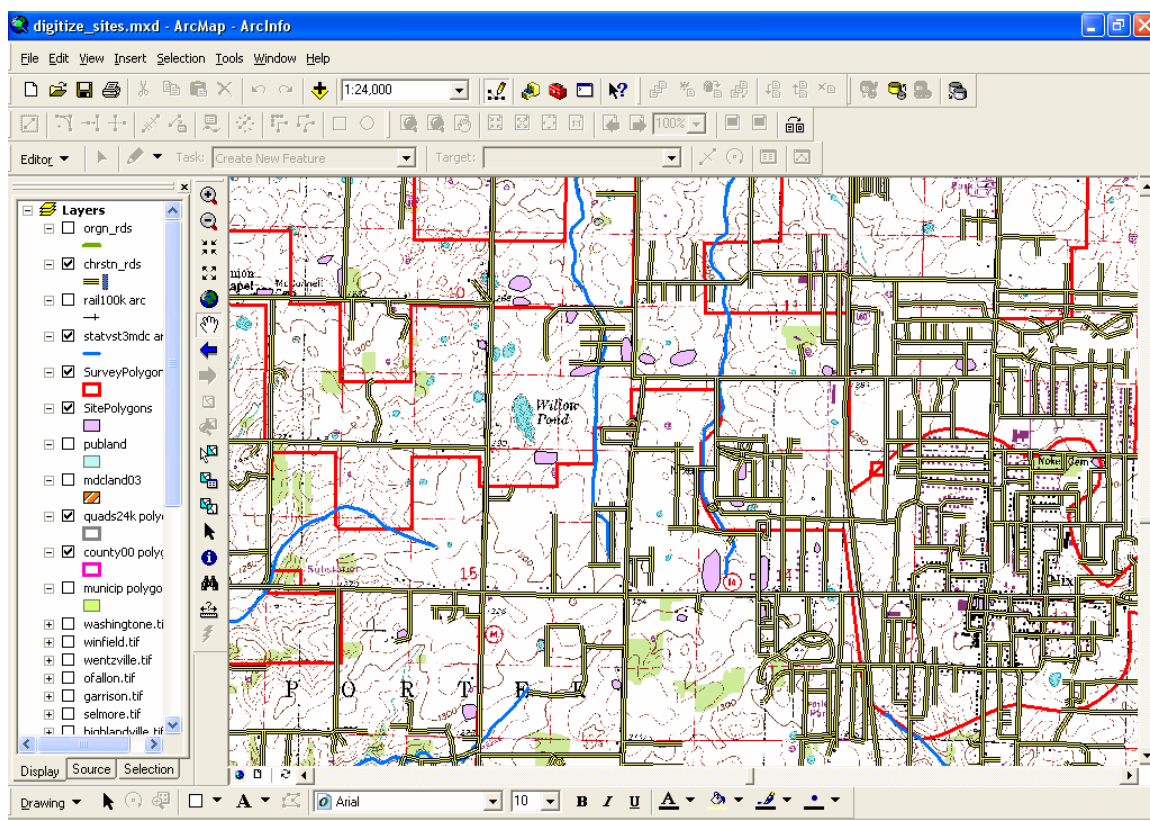
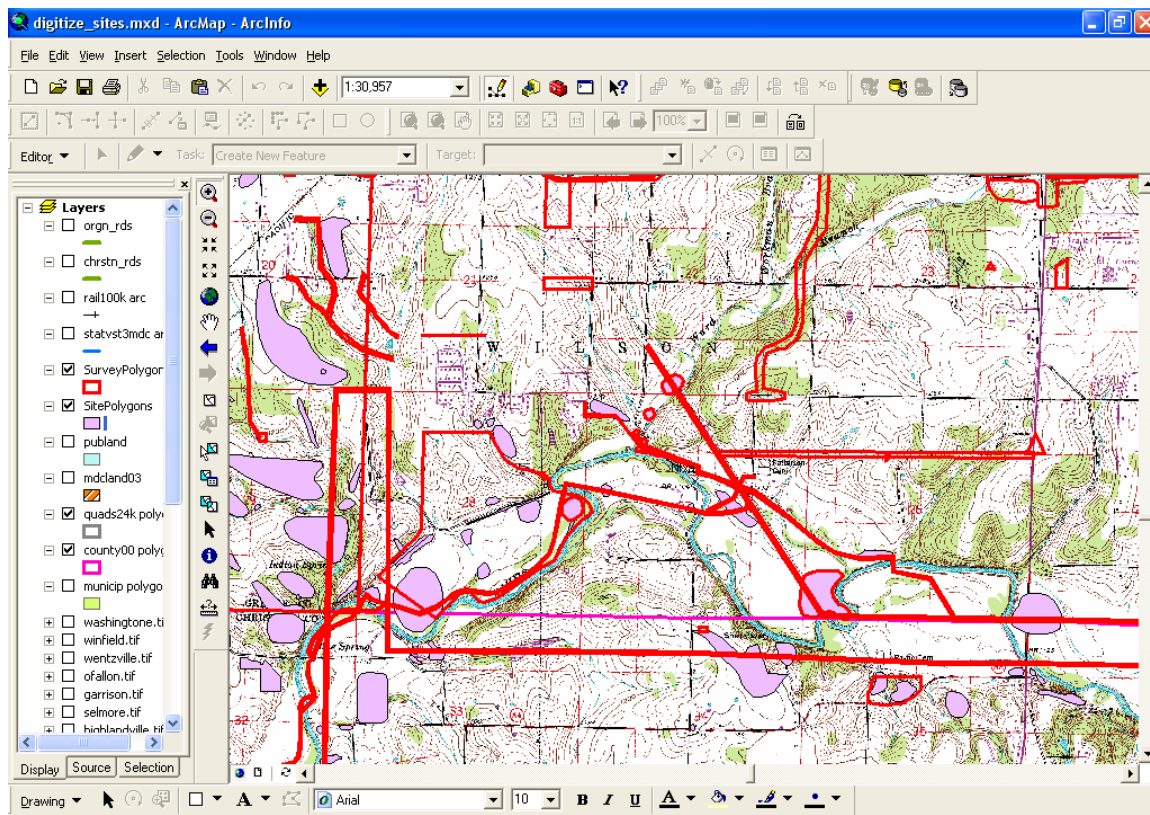


Figure 2. ArcMap project specially built to help locate the surveys and sites

Attributes of archaeologymorap.ARCHAEOLOGYSDE.Surveys							
OBJECTID*	NEW_EDIT	SHPO	SURVEY	DATE	ARCH_SITE		
1406	Edited	<Null>	SC-128	1994	Yes	Sturdevant, Craig	
3687	Edited	<Null>	SC-129	1994	Yes	Meinkoth, Michael C.	
1407	Edited	<Null>	SC-130	1994	No	Harl, Joseph L.	
1423	Edited		SC-131	1994	No	Walters, Gary Rex	
3053	Edited		SC-132	1995	No	Markman, Charles W.	
2852	Edited	<Null>	SC-133	1995	Yes	Harl, Joseph L.	
2714	Edited	<Null>	SC-134	1995	No	Snyder, Jim	
Record: 0 Show: All Selected Records (1 out of 6754 Selected.)							

Attributes of archaeologymorap.ARCHAEOLOGYSDE.Project_Types			
OBJECTID*	SURVEY	PRJCT_TYPE_ID	
124	SC-131	Archaeology	
110	SC-132	Archaeology	
125	SC-133	Archaeology	
111	SC-134	Archaeology	
Record: 0 Show: All Selected Records (1 out of 482 Selected.)			

Attributes of archaeologymorap.ARCHAEOLOGYSDE.Secondary_Authors			
OBJECTID*	SURVEY	AUTHORS_OTHER	
2400	SC-133	Keepen, Michael	
2401	SC-133	Spence, Jennifer L.	
385	SC-136	Harl, Joseph L.	
Record: 0 Show: All Selected Records (2 out of 2442 Selected.)			

Attributes of archaeologymorap.ARCHAEOLOGYSDE.Methodology			
OBJECTID*	SURVEY	METHOD_ID	
218	SC-132	excavation	
250	SC-133	pedestrian	
251	SC-133	transects	
252	SC-133	shovel probe	
Record: 0 Show: All Selected Records (2 out of 1028 Selected.)			

Attributes of archaeologymorap.ARCHAEOLOGYSDE.Site2Survey			
OBJECTID*	SURV	SITE_ID	
13701	SL-130	SL745	
13593	SL-133	SL744	
13694	SL-135	SL112	
13695	SL-135	SL191	
Record: 0 Show: All Selected Records (1 out of 20248 Selected.)			

Figure 3. Examples of survey tables found in the geodatabase

The Cultural Resource Management Geodatabase

The geographic information system (GIS) and tabular data for the Cultural Resource Management Project are stored and managed in a geodatabase using a spatial database engine (SDE) on a structured query language (SQL) server. Relationship classes are used to relate (link) tables using a common identifier.

The geodatabase consists of features, data tables, relationship classes and domains. Survey and site boundaries are digitized features. They are related (linked) to tables. Currently, there are tables associated with surveys for reporting secondary authors, project types, project methodologies, specific sites that are found within specific surveys, and general survey information. Tables associated with sites are cultural affiliation, site type, material reported, sampling techniques, remote sensing techniques, features present, land status, and general site information. Relationship classes determine how tables are linked to the digitized features. Domains are lists of items, such as project types or methodologies. Domains offer the person entering data a list of choices. Clicking on an item enters it into the database.

Tables

Survey Data Table

The Surveys Table is used to hold information concerning a survey area and project report. It is the main table to which most other tables are linked. Currently this table is maintained independently from the Survey Polygons. This table contains legacy data from a Microsoft Access database that had no spatial coordinates. Once all the survey reports for the State have been digitized, this table will be permanently attached to the Survey Polygons.

Field Name: ObjectID

Data Type: Integer

Definition: A unique number used by the geodatabase system to identify a record.

Field Name: New_Edit

Data Type: text

Definition: New = new survey record; Edit = existing survey record that has been edited.

Field Name: SHPO_ID

Data Type: text

Definition: A unique identifier given to a proposed project by the SHPO staff.

Field Name: Survey_ID

Data Type: text

Definition: A unique identifier given to a survey.

Field Name: Date

Data Type: integer

Definition: Year the survey was conducted.

Field Name: Arch_Site
Data Type: text
Definition: Yes = a site of cultural or historical significance is present in the survey area; No = a site is not present.

Field Name: Author
Data Type: text
Definition: The primary author of the report.

Field Name: Title
Data Type: text
Definition: The title of the report.

Field Name: Cndctd_By
Data Type: text
Definition: The agency, business or organization that conducted the survey.

Field Name: Cndct_For
Data Type: text
Definition: The agency for which the survey was conducted.

Field Name: Comments
Data Type: text
Definition: A field used for miscellaneous information.

Survey Polygons Table

Most of the fields in the Survey Polygons Table are used by the geodatabase system to define and draw the outline of the survey area. This is the attribute table of the survey polygon features.

Field Name: ObjectID
Data Type: Integer
Definition: A unique number used by the geodatabase system to identify a record.

Field Name: Survey_ID
Data Type: text
Definition: A unique identifier given to a survey. This field links the survey polygon table to the Surveys table.

Methodology Table

The Methodology Table is used to identify the methods used to explore a survey area. It is a separate table because it has a one-to-many relationship with the Surveys table.

Field Name: ObjectID
Data Type: Integer

Definition: A unique number used by the geodatabase system to identify a record.

Field Name: Survey_ID

Data Type: text

Definition: A unique identifier given to a survey. This ID links the Methodology table to the Surveys table.

Field Name: Method_ID

Data Type: integer

Definition: This ID links the Methodology table to Methodology domain. It identifies the method(s) used to look for culturally or historically significant sites in a survey area. See Methodology Domain for possible values.

Project Type Table

The Project Type Table is used to identify the purpose(s) of the survey. It is a separate table because it has a one-to-many relationship with the Surveys table.

Field Name: ObjectID

Data Type: Integer

Definition: A unique number used by the geodatabase system to identify a record.

Field Name: Survey_ID

Data Type: text

Definition: A unique identifier given to a survey. This ID links the Project Types table to the Surveys table.

Field Name: Prjct_Type_ID

Data Type: integer

Definition: This ID links the Project Types table to the Project Types domain. It identifies the type or purpose of the survey. See Project Type Domain for possible values.

Secondary Author Table

The Secondary Author Table is used to give the names of any additional authors of a report. It is a separate table because it has a one-to-many relationship with the Surveys table.

Field Name: ObjectID

Data Type: Integer

Definition: A unique number used by the geodatabase system to identify a record.

Field Name: Survey_ID

Data Type: text

Definition: A unique identifier given to a survey.

Field Name: Authors_Other

Data Type: text

Definition: The name(s) of additional authors of the report.

Site2Survey Table

The Site2Survey Table is used to link any sites of cultural or historical significance to the survey area. It is a separate table because it has a one-to-many relationship with the Surveys table.

Field Name: ObjectID

Data Type: Integer

Definition: A unique number used by the geodatabase system to identify a record.

Field Name: Survey_ID

Data Type: text

Definition: A unique identifier given to a survey.

Field Name: Site_ID

Data Type: text

Definition: A unique identifier given to a site of cultural or historical significance.

Site Polygons Table

Most of the fields in the Site Polygons Table are used by the geodatabase system to define and draw the outline of the sites area. This is the attribute table of the sites polygon features.

Field Name: ObjectID

Data Type: Integer

Definition: A unique number used by the geodatabase system to identify a record.

Field Name: New_Edit

Data Type: text

Definition: New = new site record; Edit = existing site record that has been edited.

Field Name: Site_ID

Data Type: text

Definition: A unique identifier given to a site of cultural or historical significance.

Site Data Table

The Site Data Table is used to hold information concerning a site area and its associated data. It is the main table to which most other sites tables are linked.

Field Name: ObjectID

Data Type: Integer

Definition: A unique number used by the geodatabase system to identify a record.

Field Name: Site_ID

Data Type: Text

Definition: The unique ID number given to individual sites.

Field Name: New_Edit

Data Type: Text

Definition: New = new survey record; Edit = existing survey record that has been edited.

Field Name: Date

Data Type: Text

Definition: The year the site was evaluated

Field Name: Rec_Org

Data Type: Text

Definition: Name of the recording organization

Field Name: Revisit

Data Type: Text

Definition: Yes = was a revisit of an already known site; No = not a revisit

Field Name: NRHP

Data Type: Text

Definition: What is the sites NRHP status. See NRHP Domain for possible values.

Field Name: Description

Data Type: Text

Definition: Description of the site location found in the report.

Field Name: Collection

Data Type: Text

Description: Yes = a collection was conducted; No = no collection was made.

Field Name: Repository

Data Type: Text

Description: Where cultural material are stored.

Field Name: Illustrations

Data Type: Text

Description: Yes = illustrations were included in the report; No = no illustrations in report.

Field Name: Report

Data Type: Text

Description: Yes = Site associated with a CRM report; No = not associated with a report.

Field Name: Comments

Data Type: Text

Description: A field used for miscellaneous information.

Field Name: Human_Remains

Data Type: Text

Description: Whether or not human remains were located with site. See Human Remains Domain for possible values.

Cultural Affiliation Table

Field Name: ObjectID

Data Type: Integer

Description: A unique number used by the geodatabase system to identify a record.

Field Name: Site_ID

Data Type: Text

Description: The unique ID number given to individual sites.

Field Name: Affiliation

Data Type: Text

Description: The cultural affiliation associated with the site. See Cultural Affiliations Domain for possible values.

Site Type Table

Field Name: ObjectID

Data Type: Integer

Description: A unique number used by the geodatabase system to identify a record.

Field Name: Site_ID

Data Type: Text

Description: The unique ID number given to individual sites.

Field Name: Type

Data Type: Text

Description: Specific definition the type of site. See Site Type Domain for possible values.

Material Table

Field Name: ObjectID

Data Type: Integer

Description: A unique number used by the geodatabase system to identify a record.

Field Name: Site_ID

Data Type: Text

Description: The unique ID number given to individual sites.

Field Name: Material

Data Type: Text

Description: What types of materials were found at the site. See Materials Reported Domain for possible values.

Sampling Technique Table

Field Name: ObjectID

Data Type: Integer

Description: A unique number used by the geodatabase system to identify a record.

Field Name: Site_ID

Data Type: Text

Description: The unique ID number given to individual sites.

Field Name: Technique

Data Type: Text

Description: Methods that were used to examine the site. See Sampling Technique Domain for possible values.

Remote Sensing Table

Field Name: ObjectID

Data Type: Integer

Description: A unique number used by the geodatabase system to identify a record.

Field Name: Site_ID

Data Type: Text

Description: The unique ID number given to individual sites.

Field Name: Technique

Data Type: Text

Description: Remote sensing methods used to examine the site. See Remote Sensing Domain for possible values.

Features Table

Field Name: ObjectID

Data Type: Integer

Description: A unique number used by the geodatabase system to identify a record.

Field Name: Site_ID

Data Type: Text

Description: The unique ID number given to individual sites.

Field Name: Feature

Data Type: Text

Description: Features that were found at the site. See Features Domain for possible values.

Land Status Table

Field Name: ObjectID

Data Type: Integer

Description: A unique number used by the geodatabase system to identify a record.

Field Name: Site_ID

Data Type: Text

Description: The unique ID number given to individual sites.

Field Name: Land_Use

Data Type: Text

Description: The topographical description of the land where the site is located. See Land Status Domain for possible values.

Topographical Location Table

Field Name: Object ID

Data Type: Integer

Definition: A unique number used by the geodatabase system to identify a record.

Field Name: Site_ID

Data Type: text

Definition: A unique identifier given to a site of cultural or historical significance.

Field Name: Topo_Location

Data Type: Integer

Definition: The prominent topographical features at a site. See Topo Location Domain for possible values.

Domains

Domains appear as drop-down lists when using the geodatabase.

Methodology Domain

The Methodology domain is used by the Methodology table to identify the method(s) used to explore a survey area. Possible values are auger probe; excavation; interviews; literature search; mechanical stripping; pedestrian; photographic analysis; plowed; raking; shovel probe; surface collection; test pit; transects; trenching; and screening.

Project Type Domain

The Project Type domain is used by the Project Type table to identify the purpose(s) of the survey. Possible values are archaeology; architecture; event location; phase II; and phase III.

New_Edit Domain

The New_Edit domain is used by the Surveys and Sites Polygons tables. Possible values are new and edited.

Yes_No Domain

The Yes_No domain is used by the Survey Data and Site Data Table. Possible values are yes and no.

Cultural Affiliations Domain

The Cultural Affiliations Domain is used by the Cultural Affiliation Table to determine the time period(s) associated with the site. Possible values are Pre-Clovis, Paleo-Indian, Dalton, Archaic, Early Archaic, Middle Archaic, Late Archaic, Woodland, Early Woodland, Middle Woodland, Late Woodland, Terminal Late Woodland (Emergent Mississippian), Mississippian, Early Mississippian, Middle Mississippian, Late Mississippian, Proto-Historic, Historic Native American, Historic, Colonial (1700-1803), Territorial (1804-1820), Antebellum (1821-1861), Civil War (1861-1865), Early Industrial (1866-1899), Urban/Industrial (1900-1960), Prehistoric, and Other.

Features Domain

The Features Domain is used by the Features Table to list the feature(s) present at the site. Possible values are house basin (prehistoric), storage pit, privy, house cellar (historic), house foundation, well/cistern, burial pit, activity foci, cache, earth oven, hearth, post mold, wall trench (prehistoric), wall trench (historic), masonry/daub wall (historic/prehistoric), nut processing, basins, medium deep pits (20-50 or 60 cm deep), deep pits (over 50 or possibly 60 cm deep) and bell-shaped pits.

Human Remains Domain

The Human Remains Domain is used by the Site Data Table to indicate the status of human remain on the site. Possible values are reported but not confirmed and confirmed.

Land Status Domain

The Land Status Domain is used by the Land Status Table to indicate land use(s) at the site. Possible values are cultivated, pasture, wooded, urban, cemetery, submerged, and other.

Materials Reported Domain

The Materials Reported Domain is used by the Material Table to record the types of materials found at the site. Possible values are lithics, lithic tool, ceramics (prehistoric), ceramics (historic), floral, faunal, historic, glass, metal, building materials, and other.

NRHP Domain

The NRHP Domain is used by the Site Data Table to indicate the status of the site in regards to the National Register of Historic Places. Possible values are unevaluated, listed, eligible, and not eligible.

Remote Sensing Domain

The Remote Sensing Domain is used by the Remote Sensing Table to record the remote sensing method(s) used to examine the site. Possible values are magnetometer, ground penetrating radar, resistivity, sonar, aerial/satellite photography, infrared photography, and other.

Sampling Technique Domain

The Sampling Technique Domain is used by the Sampling Technique Table to identify the method(s) used to examine the site. Possible values are pedestrian survey, shovel test, soil cores/probes, auger tests, trenching, test units, and other.

Site Type Domain

The Site Type Domain is used by the Site Type Table to provide a specific definition or definitions of the type of the site. Possible values are lithic scatter, mount/cairn, cemetery/mortuary, habitations (prehistoric), habitation (historic), extraction camp, cave/rockshelter, quarry, historic scatter, rock art, commercial/industrial, public, military, governmental, trail/trace, and other.

Topo Location Domain

The Topo Location Domain is used by the Topographic Location Table to indicate the prominent topographical features at a site. Possible values are knoll, hill, ridge, slope, bluff top, floodplain, island, sand dune, river/stream terrace, alluvial/colluvial fan, and other.

Recording Organization Domain

The Recording Organization Domain is used by the Site Data Table to indicate the organization responsible for gathering the information about the site supplied in the report. Possible values tentatively are American Resources Group, Ltd., ARC, Archaeological Research Center, ASM, Burns & McDonnell, Craig Sturdevant, Dept. of Archaeology-UMSL, Don L. Dycus, RPA, Environmental Research Center, Inc., Fischer-Stein Associates, Gateway Archeology, George Butler & Associates, Historic Preservation Program, Markman & Associates, Inc., MDC, MoDNR, MoDOT, MU – Columbia, NEMOSU (Truman), Other, SCI Engineering, Inc., SEMO, TRIAD Research Services, University of Illinois, US Army COE, Vulture Ventures, WAPORA, Inc., Washington University.

Repository Domain

The Repository Domain is used by the Site Data Table to indicate the location where collected cultural materials are being kept. Possible values tentatively are Fischer-Stein Assoc., HPP/DPHP/DNR, Landowner, Lincoln University, Luther College, MoDOT/MHTD, MU – Columbia, Other, Private Collection, SCI Engineering, Inc., SEMO, University of Illinois, US Army COE.

Table Relationships

The Survey Data Table has a one-to-many relationship with the Survey Polygons, Methodology, Project Type, Secondary Author and Site2Survey tables. This means there is one record per survey in the Survey Data Table, but there can be one or more records related to the survey in each of the other tables. The tables are linked via the Survey_ID field.

The Site Data Table has a one-to-many relationship with the Site Polygons, Cultural Affiliation, Feature, Land Status, Material, Remote Sensing, Sampling Technique, Site2Survey, Site Type, and Topo Location tables. This means there is one record per site in the Site Data Table, but there can be one or more records related to the site in each of the other tables. The tables are linked via the Site_ID field.

Usability of the Geodatabase

This geodatabase will allow the archaeology data for the state of Missouri to be used in ways that it never has been before. Now that the data will be in a digital format it can be accessed quickly and easily. In the past, it took many hours to sort through the boxes of data to locate the information needed for a new project. This geodatabase allows that to be accomplished in a fraction of the time. An area of interest can be zoomed into and existing surveys and sites can be identified quickly see the associated information (Figure 4).

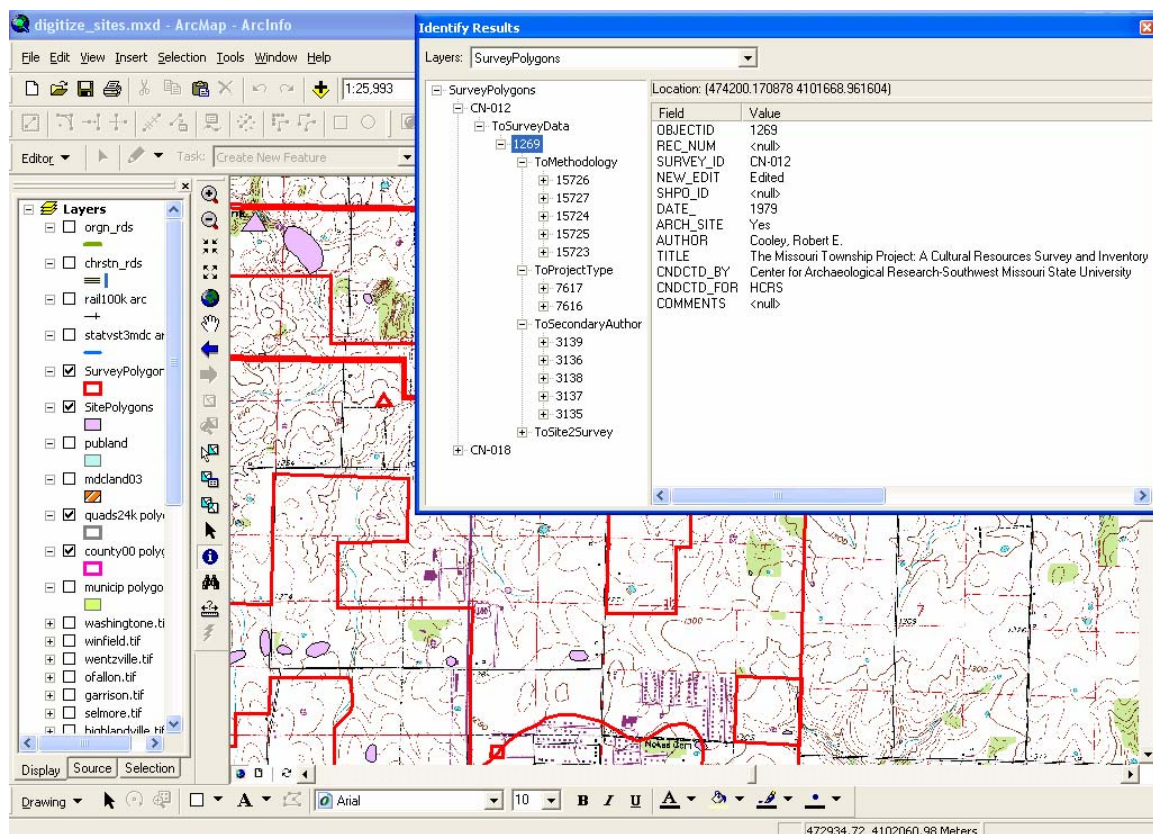


Figure 4. Information associated with surveys and sites can be quickly pulled up.

Another advantage to the geodatabase is that the archaeology data can now be queried in ways that were not possible before the data was digital. It is now possible to sort the data and query by any of the table attributes associated with the polygons. This is a very powerful tool. For instance, all the surveys that were conducted in a particular year by a specific agency can be queried and examined in a matter of seconds. It is also possible to bring in ancillary data (such as soils, geology, roads, etc.) and perform queries based on survey and site location relative to these data. For instance, all sites within a specific county that exist on a particular soil type or within a pre-determined distance from a stream (figure 5). This feature allows the users of this data many more options than were previously available.

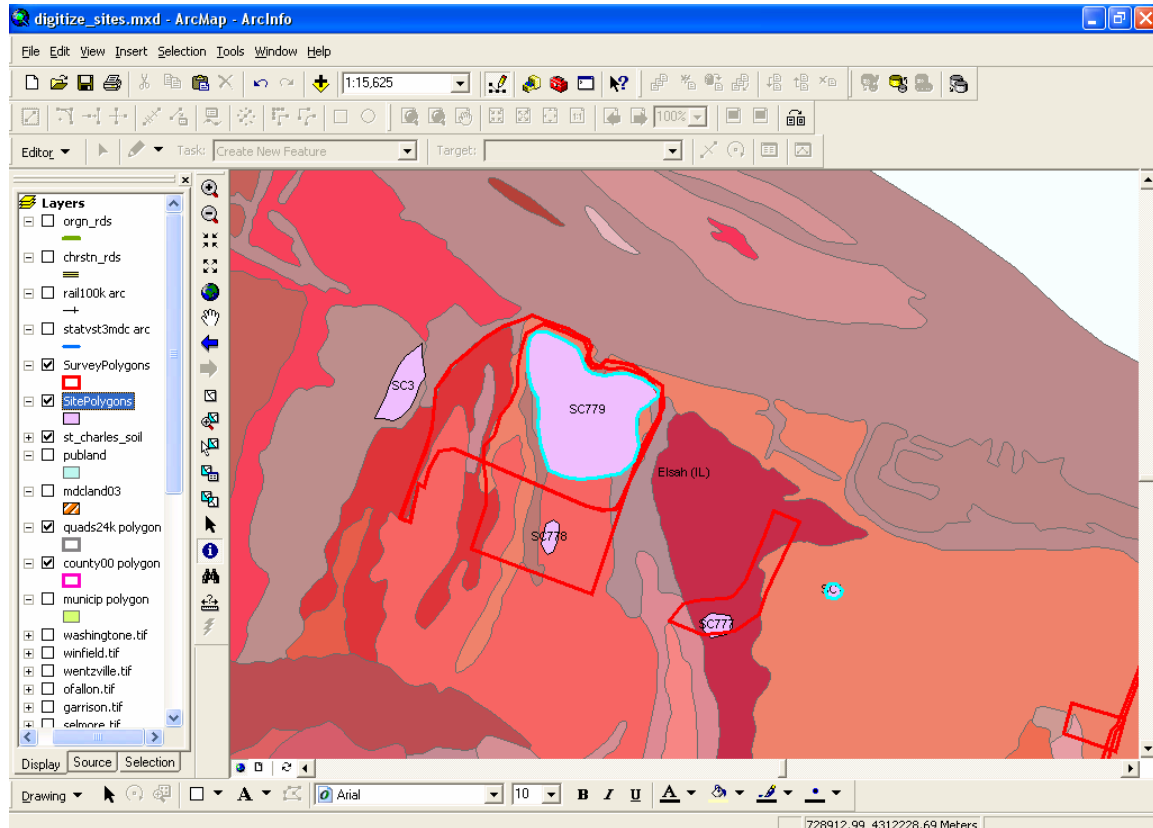


Figure 5. Example of a query; sites found on a specific soil type in St. Charles County.